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BVWST Project: 20210
May 9, 1991

Mr. Christopher Corbett
Remedial Project Manager
United States Environmental
Protection Agency - Region III
841 Chestnut Street (9th Floor)
Philadelphia, PA 19107

Dear Mr. Corbett:

In accordance with the Addendum Number 5 of the Work Plan for the Brown's Battery Breaking Site (work assignment number 91-01-3L84) and your verbal directions, I have enclosed a copy of our "Evaluation of Potential Bedrock Aquifer Condition Using Existing Overburden Data and Remedial Investigation Results."

I believe this document gives you sufficient information to decide whether a Phase IV Field Investigation is necessary. We look forward to your decision on the Phase IV investigation and to the successful completion of this work assignment.

If you have any questions, please do not hesitate to call me.

Very truly yours,

B&V WASTE SCIENCE AND TECHNOLOGY CORP.

~~Joseph~~ B. Gormley, Jr., P.E.

Enclosure

cc: C. Pryately

BROWN'S BATTERY BREAKING SITE
EVALUATION OF POTENTIAL BEDROCK AQUIFER CONDITION
USING EXISTING OVERBURDEN DATA AND REMEDIAL INVESTIGATION RESULTS

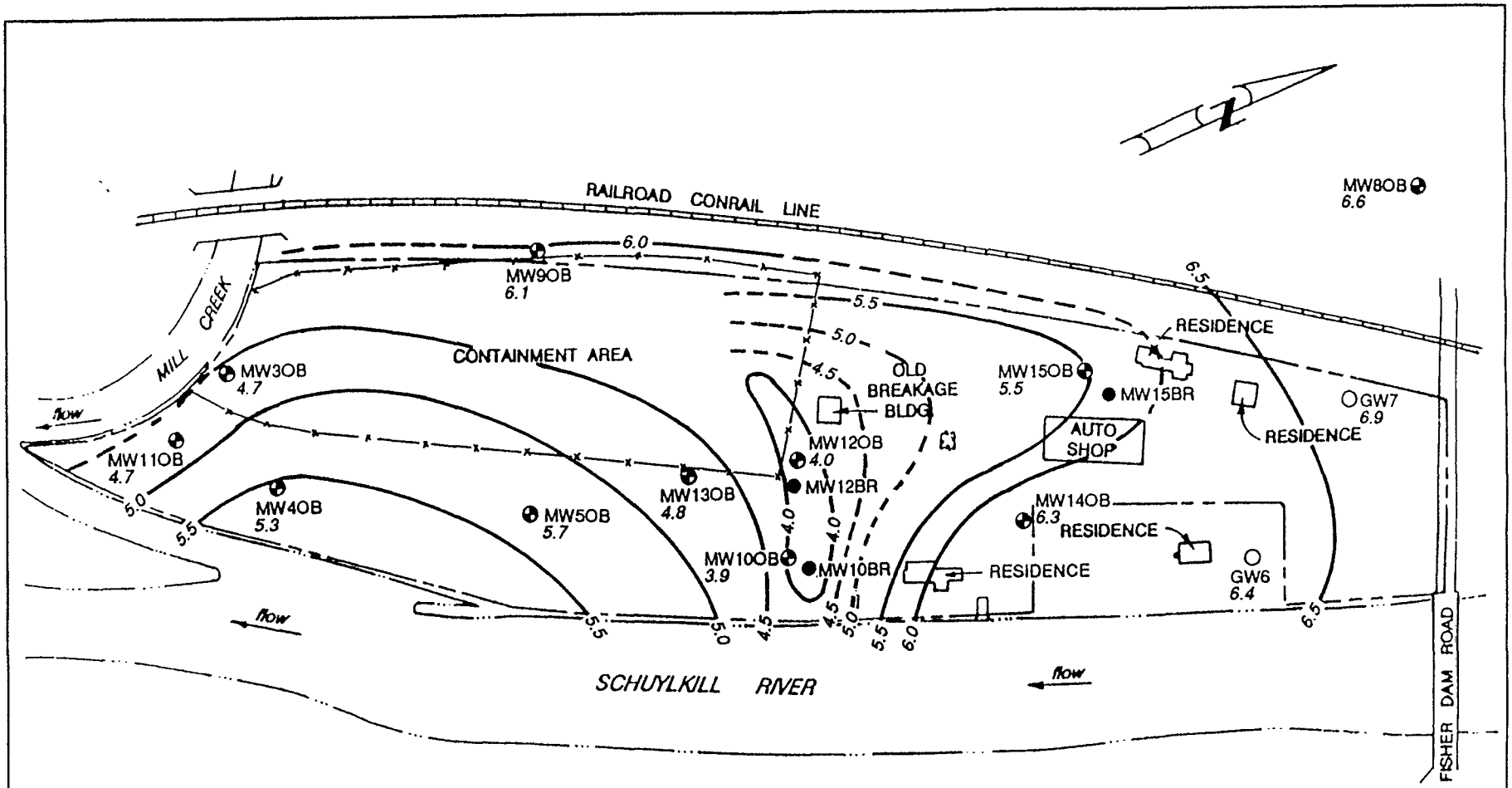
The ARCS III team has been requested by the Environmental Protection Agency Remedial Project Manager (RPM) to evaluate the potential bedrock aquifer condition at the Brown's Battery Breaking Site using existing overburden aquifer data, chemical results from one existing bedrock well, and results of the ongoing Remedial Investigation/Feasibility Study. Data used for this evaluation, as directed by the RPM, are taken from investigations conducted from 1989 through April 1991.

Chemical results from the April 1991 sampling effort have not been received and only physical results (pH, temperature, specific conductance) were included in this effort. Results of water samples collected by the ARCS team in March 1991 revealed significant concentrations of lead in newly constructed monitoring wells located near the battery breaking building. Lead levels in these wells ranged from two times higher to an order of magnitude higher than lead levels previously established in other site overburden wells.

Information available on the bedrock aquifer consists of the water quality results obtained from an existing potable water well located in the northeast corner of the site (GW7). This well is reported to penetrate the bedrock aquifer, however, no measurements have been made by the ARCS Team to confirm this report. Therefore, conclusions reached as a result of this review are based upon results obtained from GW7, judgements made about physical characteristics of the site and data from the overburden aquifer rather than direct bedrock aquifer measurements.

Figure 1 presents the locations of the eleven monitoring wells and two potable wells currently on the site. The areas of similar pH have been extrapolated using the April 1991 water quality results and surface features on the site. The pH values are being used to illustrate results that correspond with other supporting information about the site, including:

- the past acid deposition practices in the area of the breaking building,
- the low buffering capacity of the metamorphic, crystalline rocks on the site,
- the expected moderately acidic background water in the shallow aquifer,
- the predicted direction of flow for the overburden aquifer in the southern direction,



KEY

- MW5OB 4.0 - EXISTING OVERBURDEN MONITORING WELL WITH ph VALUES
- MW10BR - PROPOSED BEDROCK MONITORING WELL LOCATION
- GW6 - EXISTING RESIDENTIAL WELL WITH ph VALUES
- ph ISOCONCENTRATIONS

NOTE: GW7 IS REPORTED TO BE A BEDROCK WELL.
GW6 IS REPORTED TO BE AN OVERBURDEN WELL.

The Earth Technology Corporation

WA NO. 91-01-3L84

FIGURE 1
CONCENPTUAL MODEL OF
pH CONCENTRATIONS - APRIL 1991
BROWN'S BATTERY BREAKING SITE

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- the possible leaching of residual acid from wastes present in the containment area in the predicted direction of overburden flow.

Tables 1 and 2 summarize the results of samples collected from monitoring wells at the site in March 1991. Samples were collected by the ARCS III team and analyzed for lead by atomic adsorption spectroscopy at the REAC laboratory. The validated report was received by the ARCS team on May 3, 1991. The following four issues apply to this data set:

1. Four overburden monitoring wells were drilled and constructed in March 1991. All four wells are located in areas believed to be near potential sources of lead due to their proximity to the breaking building. Three of these wells have only one round of lead results received and one well does not have a metals sample received. All four of these wells were resampled in April 1991.

2. Results received from MW12OB and the duplicate sample collected from this well were an order of magnitude higher, with regard to lead concentration, than any other filtered sample result previously recorded at the site. The sample result and duplicate result were identical with lead concentrations of 150 ug/L. The lead content of MW13OB was 27 ug/L. This value is twice as high as previous groundwater results in the area.

3. Makeup water used by the drilling contractor to drill and develop MW9BR, MW10BR, MW12BR, MW12OB, MW13OB, MW14OB and MW15OB contained measurable amounts of lead. Even though the lead concentrations reported for the makeup water were low for the two samples collected (13 ug/L and 9 ug/L respectively), the appearance of cross contamination complicates the interpretation of the data for these wells.

4. Samples MW-09-BR, MW-12-BR and MW-10-BR were collected and preserved by the Environmental Response Team according to protocols other than those specified in the project Qapjp. In addition, these three borings did not meet drilling and construction standards specified in the Work Plan Addendum, dated March 1991. Therefore sample results are not being considered for this effort.

Table 3 summarizes groundwater quality results for the monitoring wells and potable water wells present on the Brown's Site over the past three years of sample collection for the Remedial

TABLE 1

Results of the Metals Analysis
PROJECT: WA# 3468 BROWN'S BATTERY WATER SAMPLES

Client#	Location:	Date Sampled	Date Received	Parameter: Lead	DETECTION LIMIT
				Unit: ug/l	ug/l
A,B 7486	MW-09-BR	03/12/91	03/13/91	660	5
A,B 7487	MW-12-BR	03/12/91	03/13/91	770	5
A,B 7488	MW-10-BR	03/12/91	03/13/91	8	5
001	MW-03	03/20/91	03/21/91	ND	5
002	MW-04	03/20/91	03/21/91	11	5
003	MW-05	03/20/91	03/21/91	7	5
004	MW-11	03/20/91	03/21/91	5	5
005	MW-10	03/20/91	03/21/91	ND	5
006	MW-09	03/20/91	03/21/91	ND	5
007	MW-08	03/20/91	03/21/91	ND	5
008	FB-01	03/20/91	03/21/91	ND	5
009	EB-01	03/20/91	03/21/91	ND	5
1A	MW-15	03/21/91	03/25/91	11	5
2A	MW-13	03/21/91	03/25/91	27	5
3A	MW-12	03/21/91	03/25/91	150	5
4A	MW-21	03/21/91	03/25/91	150	5

ND denotes Not Detected

Source: Analytical Report for Water Samples Collected
March 20 - 23, 1991
Brown's Battery Breaking Site
Environmental Response Team
April 30, 1991

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TABLE 2

Results of the Metals Analysis
PROJECT: WA# 3468 BROWN'S BATTERY WATER SAMPLES

Client#	A 06763	A 06764	DETECTION
Location:	WT-1	WT-2	LIMIT
Unit:	ug/l	ug/l	ug/l
Parameter:			
Cadmium	ND	ND	25
Chromium	ND	ND	50
Copper	ND	ND	50
Lead	13	9	5
Zinc	100	100	25

ND denotes Not Detected

Note: Samples WT-1 and WT-2 were collected from the drilling contractor's water tank during the March 1991 drilling effort.

Source: Analytical Report for Water Samples Collected March 20 - 23, 1991 Brown's Battery Breaking Site Environmental Response Team April 30, 1991

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BROWN'S BATTERY BREAKING SITE
TABLE 3

WELL NO.	Sample Period	[Pb] unfiltered	[Pb] filtered	pH	TEMP (°C)	S.C. (umhos)	DTW (ft)	Eh
MW-3	Phase 1	NT	NT	NT	NT	NT	NT	NT
	Phase 2	R	BDL	4.8	19.5	115	9.9	NT
	Resamp.	NT	NT	NT	NT	NT	9.6	NT
	Phase 3 March	NT	BDL	5.2	NT	NT	NT	NT
	Phase 3 April	*	*	4.7	9.3	370	9.89	171
MW-4	Phase 1	NT	NT	NT	NT	NT	NT	NT
	Phase 2	R	BDL	5.0	16.1	192	11.2	NT
	Resamp.	NT	NT	NT	NT	NT	9.8	NT
	Phase 3 March	NT	11	5.9	NT	NT	NT	NT
	Phase 3 April	*	*	5.3	9.4	200	10.10	160
MW-5	Phase 1	NT	NT	NT	NT	NT	NT	NT
	Phase 2	R	BDL	5.2	17.2	115	11.1	NT
	Resamp.	NT	NT	NT	NT	NT	8.73	NT
	Phase 3 March	NT	7	5.6	NT	NT	NT	NT
	Phase 3 April	*	*	5.7	8.3	90	9.25	184
GW-6	Phase 1	BDL	NT	5.7	19.5	255	NT	NT
	Phase 2	4 J	NT	6.0	18.9	240	NT	NT
	Resamp.	BDL	NT	6.4	8.4	200	NT	NT
	Phase 3 March	NT	NT	NT	NT	NT	NT	NT
	Phase 3 April	NT	NT	NT	NT	NT	NT	NT

WELL NO.	Sample Period	[Pb] unfiltered	[Pb] filtered	pH	TEMP (°C)	S.C. (umhos)	DTW (ft)	Eh
GW-7	Phase 1	BDL	NT	6.0	17.5	215	NT	NT
	Phase 2	BDL	NT	6.6	16.0	180	NT	NT
	Resamp.	NT	NT	NT	NT	NT	NT	NT
	Phase 3 March	NT	NT	NT	NT	NT	NT	NT
	Phase 3 April	*	*	6.9	11.6	220	NT	145
MW-8	Phase 1	NT	NT	NT	NT	NT	NT	NT
	Phase 2	14.5	UL	6.7	14.4	260	8.53	NT
	Resamp.	NT	NT	NT	NT	NT	8.2	NT
	Phase 3 March	NT	BDL	7.3	NT	NT	NT	NT
	Phase 3 April	*	*	6.6	9.8	247	8.30	139 #
MW-9	Phase 1	NT	NT	NT	NT	NT	NT	NT
	Phase 2	86.2	UL	5.9	14.0	420	7.07	NT
	Resamp.	NT	NT	NT	NT	NT	6.7	NT
	Phase 3 March	NT	BDL	6.1	NT	NT	NT	NT
	Phase 3 April	*	*	6.1	9.8	610	6.94	-62
MW-10	Phase 1	NT	NT	NT	NT	NT	NT	NT
	Phase 2	400J	14.3 LJ	4.0	13.7	408	9.82	NT
	Resamp.	NT	NT	NT	NT	NT	9.1	NT
	Phase 3 March	NT	BDL	4.7	NT	NT	NT	NT
	Phase 3 April	*	*	3.9	9.3	465	9.37	132

WELL NO.	Sample Period	[Pb] unfiltered	[Pb] unfilter	pH	TEMP (°C)	S.C. (umhos)	DTW (ft)	Eh
MW-11	Phase 1	NT	NT	NT	NT	NT	NT	NT
	Phase 2	151	UL	4.7	13.4	210	9.07	NT
	Resamp.	NT	NT	NT	NT	NT	8.4	NT
	Phase 3 March	NT	BDL	5.0	NT	NT	NT	NT
	Phase 3 April	*	*	4.7	8.6	240	8.73	112
MW-12	Phase 3 March	NT	150	4.3	NT	NT	NT	NT
	Phase 3 April	*	*	4.0	10.0	310	8.87	118
MW-13	Phase 3 March	NT	27	4.8	NT	NT	NT	NT
	Phase 3 April	*	*	4.8	10.0	985	8.45	138
MW-14	Phase 3 March	NT	NT	NT	NT	NT	NT	NT
	Phase 3 April	*	*	6.3	10.8	460	8.67	147
MW-15	Phase 3 March	NT	11	6.3	NT	NT	NT	NT
	Phase 3 April	*	*	5.5	10.1	205	9.64	150

-Redox meter began fading after three readings. New batteries were installed and meter functioned for remaining effort.
* -Analyses not completed at this time.
BDL -Below Detection Limit
J -Analyte present. Reported value may not be accurate or precise.
L -Analyte present. Reported value may be biased low. Actual value is expected to be higher.
NT -Sample Not Taken
R -Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm results.
UL -Not Detected. Quantitation limit is probably higher.

Investigation/Feasibility Study (RI/FS). Both filtered and unfiltered sample results are presented for lead. The results of previous investigations at the site, conducted by the Pennsylvania Department of Environment Resources and the Environmental Protection Agency, are summarized in the Draft RI report.

Historically, no measurable lead contamination has been identified in GW7, the potable water well believed to penetrate the bedrock aquifer. GW7 is located in the northeast corner of the site in a position that is considered to be upgradient of the battery breaking building, according to regional U.S. Geologic Survey data. In addition, the pH of the water at this location is conducive to metals precipitation.

However, no direct measurements of the bedrock aquifer flow direction, transmissivity, fracture zones or recharge characteristics have been made. Therefore, little is known about the physical characteristics of the bedrock aquifer in the area underneath the site. Pumping the bedrock aquifer well on the site poses the potential for local changes in the groundwater flow direction. Well GW7 services as many as three households and one light industrial use (the auto body shop). There are no records of the amount of water drawn from GW7 and the effect on the bedrock or overburden aquifer while pumping GW7 is undocumented. Borehole logs suggest that the overburden is in hydraulic communication with the bedrock aquifer, however, vertical head relationships and hydraulic gradients are unknown.

The measured groundwater elevations in the overburden wells and the surface topography, indicate that the direction of overburden aquifer flow is to the south. The physical proximity of the site to both Mill Creek and the Schuylkill River also suggests that water in the overburden aquifer discharges to these bodies of water. In addition, surface water data collected at several stations along these two bodies of water corroborates the expected movement of overburden water into the surface water. Dissolved metals evident in a few surface water samples collected near the site appears to precipitate downstream.

In summary, the bulk of the water from the potentially contaminated overburden aquifer is expected to enter the surface water bodies adjacent to the site. Once lead-contaminated materials enter the surface water, precipitation of dissolved lead compounds appears to be rapid. However, significant data gaps exist concerning the bedrock aquifer. Although well GW7 is not currently contaminated, the potential for contaminant transport to the bedrock aquifer appears to be present on the site, especially if high dissolved lead concentrations are confirmed in MW120B and vertical migration is occurring. Without direct measurements in the bedrock aquifer, the rate or extent of contamination cannot be known.

Pumping well GW7 while monitoring water levels in other existing

overburden wells, may provide qualitative information on the relationship between the overburden and deep aquifer(s). Water levels in well GW7 would need to equilibrate prior to the start of the pumping test. Therefore, the well could not be used for a period of time until the water level stabilized. In addition, contaminants may actually be drawn in the direction of well GW7 during the test. Because so little is known about the depth, number, interaction and production capabilities of the water bearing zones onsite, it is not possible to predict the outcome of such as test and therefore, pumping GW7 is not recommended.

Bedrock wells installed in locations illustrated on figure 1 for locations marked MW10BR, MW12BR, and MW15BR would presumably allow measurement of the direction of bedrock groundwater flow, measurement of the communication between well pairs at all three locations, and chemical/physical evaluation of collected groundwater samples. Well construction would follow accepted standards for protecting against cross contamination of the overburden and bedrock aquifers. However, some uncertainty is always associated with drilling through a contaminated zone and into a potentially uncontaminated zone. In addition, the time frame for installing, developing and sampling three additional wells and the impact on the overall schedule must be considered.

Table 4 summarizes the advantages and disadvantages for the no further action or bedrock installation alternatives.

Table 4

Alternative	Advantages	Disadvantages	Impact on Remedial Alternatives
No Further Action	No Additional RI Costs	Lack of information bedrock aquifer	Inaccurate estimate of the extent of groundwater contamination could impact the need or method for groundwater remediation
Install Bedrock Wells	Define the nature and extent of contamination in the bedrock aquifer	Additional costs, potentially lengthened RI/FS schedule, and possible cross contamination	Accurate estimate of the extent of groundwater contamination could clearly define the need or method for groundwater remediation